undergone continuous and marked improvement, is certain of a cordial welcome.

We may at once state that the book is no other than it purports to be—a reprint of three lectures, the first on instruments, the second on survey methods, and the third on maps and map-making. It is in no sense a text-book on the science of surveying. It is, for example, not the sort of book that the practical surveyor would take into the field, nor would it be of much value to the student who has passed the elementary stage.

Its true function, we take it, is identical with that of a lecture, not to instruct, but rather to stimulate curiosity, not so much to teach as to show that there are things worth learning. A book of this class has a tendency to fall into a difficult category, being too technical for the ordinary reader and too simple for the expert. At the same time, we may frankly recognise that as regards this particular subject there are a large number of persons—travellers, officers, and officials, whose duties take them into the uncharted regions of the world—to whom a little knowledge of survey methods is a valuable acquisition but who have no desire or capacity to prosecute their studies further.

To these and to all others who desire a general acquaintance with a science which must always remain of great practical importance and of considerable human interest, we can cordially recommend Mr. Reeves's book.

The first chapter, dealing with the history and development of surveying instruments, profusely furnished with illustrations, as indeed is the whole book, will be found full of curious information. The treatment of modern instruments is perhaps too compressed to be thoroughly satisfactory and has a tendency to degenerate into a mere catalogue, wherein the various instruments are briefly described, but no adequate attempt is made to estimate their relative merits or defects. Thus the prismatic sextant is mentioned as an "improvement" on the ordinary form without a hint that, as a matter of fact, it was found to be no improvement, and has passed entirely out of use.

The book is well printed and misprints are not common. We scarcely know whether the spelling *geodecist* (p. 24) is intentional; if so, we must enter a protest against it.

The specimen maps are reproduced with the uniform excellence of style that we are accustomed to in the R.G.S. publications.

In conclusion we may direct attention to the map on p. 131, showing relief by "stereoscopic" colouring, *i.e.* a system wherein the varying altitudes are shown by an ordered sequence of spectrum colours, the high ground red and thence descending through greens and yellows to a blue sea. The effect of relief on such a map is very good. The eye naturally adjusts itself as in viewing near and far objects so that the tops of the hills appear nearest and the bottoms of the valleys farthest from the observer. A neglect of this principle of spectrum colours is a marked defect of the recently published half-inch Ordnance Survey map of England.

E. H. H.

MATHEMATICAL TEXT-BOOKS.

(1) *Elements of Plane and Spherical Trigonometry.* By Prof. D. A. Rothrock. Pp. xi+147+xiv+99. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1910.) Price 6*s.* net.

(2) *Homogeneous Coordinates for Use in Colleges and Schools.* By Dr. W. P. Milne. Pp. xii+164. (London: E. Arnold, 1910.) Price 5*s.* net.

(3) *A Geometry for Schools.* By F. W. Sanderson and G. W. Brewster. Pp. x+336. (Cambridge: University Press, 1910). Price 3*s.*

(4) *Analytic Geometry.* By Prof. N. C. Riggs. Pp. xi+294. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1910.) Price 7*s.* net.

(1) THIS volume contains a fairly through treatment of the numerical aspects of plane and spherical trigonometry. In addition to this, a certain amount of attention is directed to elementary identity work, and some indication is given of the higher analytical developments of the subject, based on Demoivre's theorem, in the concluding chapter of the first part of the book. It is unfortunate that the symbol $e^{i\theta}$ is regarded as equivalent to $\exp(i\theta)$. This is the source of much error in the minds of students, and from the earliest stage it is most desirable to emphasise the distinction between the two forms. With this exception, the mode of presentation is excellent. There are numerous exercises and problems, but at present no answers are given. This is a serious omission, and it should be rectified in a new edition. Five-figure tables of logarithms and trigonometric functions are appended to the book.

(2) The utility of homogeneous coordinates when carefully employed, is undeniable. It so often happens that their properties are sketched in a brief chapter at the end of treatises on Cartesian methods, thus leading the reader to believe that the subject is one of small value and importance. It is, of course, a misuse of this instrument to apply it to metrical results, except in very special circumstances; but its application to properties of a descriptive character is particularly instructive and illuminating. The present volume contains, in a remarkably small compass, a comprehensive account of the subject, treated in exactly the right way. Its wealth of detail will be invaluable to the teacher, who will probably prefer to make selections for his pupils. The correspondence between point and line coordinates is worked out in a thorough fashion, and the part played by ideal and imaginary elements is clearly indicated. Such work as this is well within the range of the scholarship class in secondary schools, and it arouses keen interest, mainly because analysis is very properly subservient to principle. There is an admirable collection of examples. We wish the book all the success it unquestionably deserves.

(3) The plan of this book agrees to a large extent with the recommendations made in the Board of Education circular on the teaching of geometry. The proofs of the fundamental congruence and parallel theorems occupy a subordinate position, thus making it possible for the student to pass rapidly over the

initial stages and advance quickly to simple rider work. There are four main sections in the book; each of these starts with an experimental investigation and ends with the theoretical treatment of the corresponding theorems. There are abundant numerical examples, but some teachers will consider that the supply of riders is inadequate. An excellent innovation is the insertion of circle properties before areas are dealt with. This provides such an excellent field of simple and interesting riders that it is surprising that the Euclidean order has been followed so long. The last section contains as many of the theorems on ratios as are usually given in elementary text-books, the numerical examples, illustrating the use of proportion, are particularly good.

(4) The analytical geometry of the conic is treated in this volume in less detail than is usual in most text-books. For practical purposes, it is far more important for the student to acquire a correct appreciation of the principles which obtain for curves of any degree, and to master the use of infinitesimal methods. The author has therefore employed the calculus freely and applied it both to plane and skew curves and simple surfaces. The examples have been chosen rather to elucidate principles than to test analytical dexterity. The book may be used with confidence by engineering students, with whose needs it is primarily concerned.

SCIENCE AND SPECULATION.

The World of Life: a Manifestation of Creative Power, Directive Mind, and Ultimate Purpose. By Dr. A. R. Wallace, F.R.S. Pp. xvi+408. (London: Chapman and Hall, Ltd., 1910.) Price 12*s.* 6*d.* net.

THE appearance of a new book written by the veteran naturalist in his eighty-eighth year cannot fail to arouse the interest of a wide circle of readers. The work may indeed be regarded as a recapitulation of the opinions on a great variety of topics which, during a long and active literary career, extending over more than fifty years, Dr. Alfred Russel Wallace has put forth in a number of memoirs, books, and magazine articles. But to regard the work as a mere summary of the results of former labours would be to do a great injustice to its author; for there is scarcely a subject referred to in it, in which fresh facts, novel lines of reasoning, or suggestive conclusions are not presented for our consideration.

The book naturally divides itself into two portions, which are of very diverse character and unequal value and importance. As regards the first part, we must state at once that the space at our disposal is altogether insufficient to enumerate—much less to discuss—the numerous interesting problems suggested in it.

After a first chapter, devoted to a somewhat academical discussion of the nature and origin of life, we have five chapters treating on the subject with which Dr. Wallace's name will always be so honourably associated—the distribution of plants and animals. Readers familiar with the author's great work on this subject, and with his "Island Life," will be surprised and delighted to find how many novel facts and lines of treatment have suggested themselves to the author since the publication of his earlier works. Among many interesting discussions in this part of the book we may specially instance the contrasts pointed out between the more uniform floras of temperate climes and the richly diversified floras of tropical lands. These latter are shown in many cases to be in great danger of extinction through human agencies, and the interesting suggestion is made that the British Government might follow the example of the Dutch in Java, by establishing small forest reserves in our tropical colonies; such reserves, Dr. Wallace points out, need not be of anything like the extent of the animal reservations of North America and Africa, for, owing to the crowded and diversified nature of all parts of a tropical forest, small areas of even a square mile would be sufficient for the purpose.

Later chapters devoted to illustrations, extensions, and new applications of the theory of natural selection cannot fail to arrest the attention of all naturalists; we may especially refer to the discussion of "recognition marks," and those on bird life, bird migration and extinction, and the relations of bird to insect life. We may note that even when the author feels compelled to express dissent from the views of Darwin—as in his ideas concerning the origin of man's intellectual and moral faculties—we find his loyalty and devotion to his old friend and fellow-worker displayed as conspicuously as ever.

The three chapters on the geological record, well illustrated as they are by wood-cuts drawn from various sources, abound with interesting observations. We may instance his development of the ideas put forward by Dr. Smith Woodward, in an address to the British Association, concerning the tendency of groups of animals in the periods before their final extinction to run into extravagant and sometimes *bizarre* forms. This is illustrated in the case of the trilobites and ammonites.

Later chapters on the relations of the chemical elements to vital agencies, on the "mystery of the cell," on the parts played by plants, animals, and man respectively in the economy of nature, are eloquent and illuminating; but it is unfortunate that the author is never able to avoid the pitfalls of teleological speculation. This tendency is still more strikingly manifested when the author proceeds to discuss such questions as the existence of pain in the lower animals, of the non-justifiability of vivisection, of the remedies for the overcrowding of cities, and similar problems of the day. On all these and similar questions Dr. Wallace writes very confidently, sometimes intruding his speculative opinions in the midst of the treatment of purely scientific questions.

Most of the author's scientific friends—and they are very numerous—will feel regret that these and similar discussions were not reserved for a separate volume. We are all familiar, from reading his "Man's Place in the Universe," and his autobiographical work—"My Life"—with the author's peculiar views on extra-scientific, social, and political questions. Some of these tendencies to unbridled speculation seem to have reached an extreme limit in the twilight of a noble life, as when it is gravely suggested to sub-